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Taxonomic Notes on the Ant Genus *Crematogaster* in Japan (Hymenoptera: Formicidae)

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Abstract. Taxonomic notes on four species of the ant genus *Crematogaster* in Japan are given. The species treated are *C. matsumurai* Forel (=*C. matsumurai* var. *iwatensis* Santschi syn. nov.), *C. nawai* Ito stat. nov. (=*C. laboriosa* Smith, 1874 syn. nov.), *C. teranishii* Santschi stat. nov., and *C. vagula* Wheeler stat. nov. Key to species, a table of diagnoses, and SEM pictures are presented.

Key words: *Crematogaster*, ant, taxonomy, synonyms, Japan.

Introduction

The genus *Crematogaster* has been one of the ant genera unchallenged in Japan from the current viewpoint of classification. Onoyama & Morisita (1992) gave a key to and descriptions of 5 species or subspecies of the subgenus *Crematogaster* and 2 species of the subgenus *Orthocrema* occurring in Japan, but did not mention 2 available varieties described from Japan. The status of two subspecies and 2 varieties of the subgenus *Crematogaster* has not been assessed. As Onoyama (1980) stated, the examination of type material of the taxa so far described is necessary to solve the problems. I have examined some of these, and obtained some taxonomic results on four species of the subgenus *Crematogaster*, including new synonyms. As stated by Onoyama (1976), Santschi's (1930) characterization of Japanese *Crematogaster* forms is still useful. Although the number of the taxa treated in Onoyama & Morisita (1992) is the same as here, the nomenclature and taxonomic status are changed.

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Measurements and Indices

Head length (HL): maximum dorsal full-face view length from the anteriormost margin of clypeus to the posterior margin of occiput.

Head width (HW): maximum dorsal view distance across head excluding eyes.

Cephalic index (CI): HW/HL × 100.

Scape length (SL): length of scape excluding radicle.

Scape index (SI): SL/HW × 100.

Eye length (EL): maximum length of eye.

Width of frontal lobes (FW): maximum width between the right and left outermost margins of frontal lobes in dorsal view.

Pronotal width (PW): Maximum width of pronotum in dorsal view.

Weber's length of mesosoma (WL): maximum diagonal distance from the base of anterior slope of pronotum (namely excluding cervix) to the propodeal lobe (=metapleural lobe).

Propodeal spine length (PSL): lateral view length from the base of propodeal spine to its apex.

Distance between propodeal spines (PSD): maximum distance between the apices of propodeal spines.

Petiole width (PtW): maximum width of petiole in dorsal view.

Postpetiole width (PPW): maximum width of postpetiole in dorsal view.

All measurements were carried out with a direct reading micrometer apparatus (Sokubi-keisoku-souchi

Table 1. Characteristics of four Japanese species of the ant genus *Crematogaster*.

Species	Sides of pronotum	Lateral border of mesonotal dorsum	Metanotal groove at dorsolateral corner	Propodeal spines	Petiole	Subpetiolar process	Median longitudinal furrow on postpetiolar dorsum	Gastral dorsum	Hairs on hind tibiae
C. matsumurai	mostly smooth and shining	angulate and marked by a carina	slightly interrupted	short and dentiform	wider than long	undeveloped	very shallow	bicolored, rarely concolorous	mostly decumbent (30–40°)
C. nawai	entirely smooth and shining	round, not marked by a carina	not interrupted	long and acute	longer than wide	developed	deep and wide	concolorous	appressed to decumbent (0–20°)
C. teranishii	finely striate and opaque	angulate and marked by a carina	slightly interrupted	long and acute	wider than long	usually undeveloped	shallow	bicolored or nearly concolorous	mostly decumbent (30–40°)
C. vagula	mostly smooth and shining	angulate and marked by a carina	strongly interrupted	long and acute	wider than long	developed	shallow and narrow	concolorous	mostly appressed (0–10°)

made by Kogaku Co.; reading error: ±0.005 mm) attached to a stereoscopic microscope under a magnification 80×, and given in mm×100.

In Japan, four species of the subgenus *Crematogaster* (=*Acrocoelia*, the type species of the two subgenera are synonymous; see Bolton (1995)), *C. matsumurai*, *C. nawai*, *C. teranishii*, and *C. vagula*, are common so that distinction between them are useful for biological studies. A summary of the diagnostic characteristics of the four species are given in Table 1. Especially useful characters are 1) sculpture on pronotal sides, 2) convexity of mesonotal dorsum, 3) lateral carination of mesonotal dorsum, and 4) shapes of petiole and postpetiole. These are shown in scanning electron microscope pictures (Figs. 1–8). A key to the four *Crematogaster* species based on workers are given below.

Key to Four Species of the Subgenus *Crematogaster* in Japan

1. Lateral border of mesonotal dorsum round, not marked by a carina. Petiole longer than wide. Mesosomal dorsum smooth ..... ***C. nawai***

– Lateral border of mesonotal dorsum angulate and marked by a carina. Petiole wider than long. Pronotal dorsum with striae 2

2. Metanotal groove at dorsolateral corner strongly interrupted by a raised carina, so that mesonotal dorsum forming a concavity. Subpetiolar process developed. Hairs on hind tibiae mostly appressed .... ***C. vagula***

– Metanotal groove at dorsolateral corner slightly interrupted by a carina, mesonotal dorsum not forming a concavity. Subpetiolar process usually undeveloped. Hairs on hind tibiae mostly decumbent 3

3. Sides of pronotum mostly smooth and shining. Propodeal spines short and dentiform. .... ***C. matsumurai***

– Sides of pronotum finely striate and opaque. Propodeal spines long and acute .... ***C. teranishii***

Crematogaster matsumurai Forel
(Figs. 1, 2)

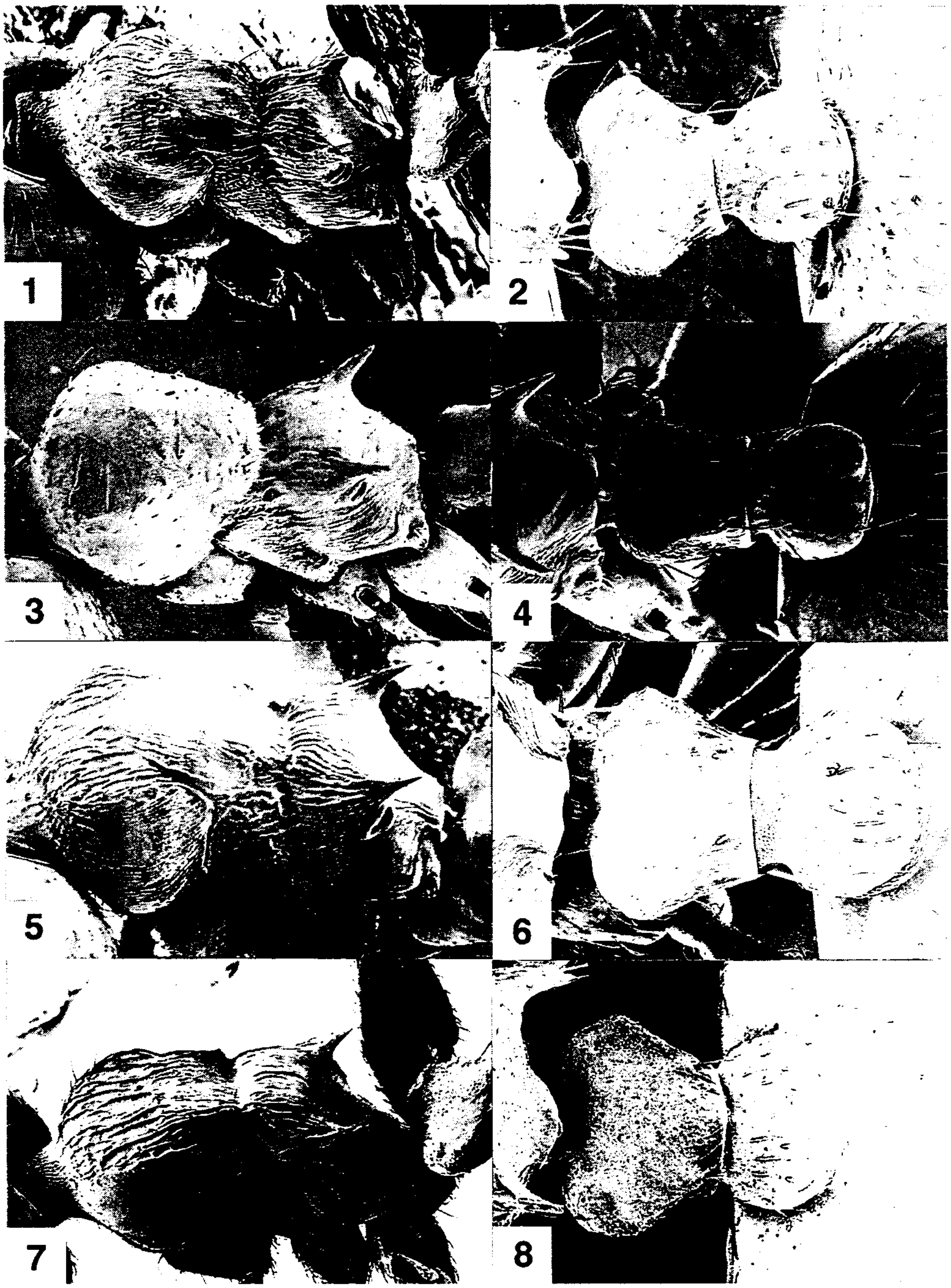
Crematogaster (*Acrocoelia*) *laboriosa* var. *matsumurai* Forel, 1901: 372. Worker. Type locality: Sapporo, Hokkaido (Matsumura leg.). [2 syntype and 3 'cotype' workers in MHNG examined.]

Crematogaster laboriosa var. *matsumurai*: Wheeler, 1906: 312, fig. Female.

Crematogaster laboriosa var. *matsumurai*: Emery, 1912: 666.

Crematogaster (*Acrocoelia*) *matsumurai*: Wheeler, 1928: 110. [Raised to species rank.]

Crematogaster (*Acrocoelia*) *brunnea* st. *matsumarai* [mis-



Figs. 1–8. Dorsolateral view of mesosoma (left) and dorsal view of petiole and postpetiole (right) of four species of Japanese *Crematogaster*. —— 1, 2, *C. matsumurai*; 3, 4, *C. nawai*; 5, 6, *C. teranishii*; 7, 8, *C. vagula*.

spelling]: Santschi, 1930: 264.

Crematogaster (*Acrocoelia*) *matsumai* [misspelling] var. *iwatensis* Santschi, 1937: 371. Worker. Type locality: Moriota [correctly, Morioka], Iwate-Ken (6 workers, C. Teranishi leg.). [3 syntype workers in NMB examined.] *Syn. nov.* [First available use of *Crematogaster* (*Acrocoelia*) *brunnea matsumarai* [misspelling] var. *iwatensis* Santschi, 1930: 264–265; unavailable name.]

Measurements (worker). HL 79–86, HW 81–93, CI 102–106, SL 61–66, SI 71–77, EL 18–20, FW 32–37, PW 49–52, WL 91–95, PSL 4–5, PSD 30–35, PtW 31–36, PPW 23–27 (5 *matsumurai* syntypes and 3 var. *iwatensis* syntypes measured).

Material examined. ⟨Honshu⟩ 1 worker, Nanbou Paradise, Tateyama, Chiba Pref., 18–V–1975, K. Onoyama leg.; 1 worker, Zenkouji, Nagano, Nagano Pref., 400 m alt., 9–X–1974, K. Onoyama leg.; 1 worker, Shizunami, Shizuoka Pref., 0 m alt., 11–VIII–1975, K. Onoyama leg.; 1 worker, Ipponmatsu, Wajima, Ishikawa Pref., 50 m alt., 14–IX–1975, K. Onoyama leg.; 1 worker, Shiroyama,Takahama, Fukui Pref., 10 m alt., 19–VIII–1973, K. Onoyama leg.; 4 workers, Aminohattyouhama, Kyoto Pref., 10 m alt., 26–VII–1972, K. Onoyama leg.; 5 workers, Kamigamo, Sakyo-ku, Kyoto, Kyoto Pref., 130 m alt., 14–VII–1972, K. Onoyama leg.; 2 dealate females, 5 workers, Kyoto University, Kitashirakawa-nishimachi, Sakyo-ku, Kyoto, Kyoto Pref., 70 m alt., 9–I–1971, K. Onoyama leg.; 2 workers, Teranomae-cho, Shishigatani, Sakyo-ku, Kyoto, Kyoto Pref., 20–VI–1973, K. Onoyama leg.; 5 workers, Kyotanabe, Kyoto Pref., 60 m alt., 28–VII–1993, K. Onoyama leg.; 3 workers, Nara Park, Nara, Nara Pref., 90 m alt., 28–X–1973, K. Onoyama leg.; 1 worker, Hidein-cho, Tennouji-ku, Osaka, Osaka Pref., 10 m alt., 12–VIII–1972, K. Onoyama leg.; 1 worker, Soujiji, Takatsuki, Osaka Pref., 10 m alt., 30–VII–1975, K. Onoyama leg.; 1 worker, Motomachi, Kobe, Hyogo Pref., 100 m alt., 6–IX–1975, K. Onoyama leg.; 2 workers, Kitayashira, Himeji, Hyogo Pref., 30 m alt., 27–VII–1975, K. Onoyama leg.; 1 worker, Nakamura-kaigan, Oki, Shimane Pref., 0 m alt., 6–VIII–1971, K. Onoyama leg.

Distribution. Japan (Hokkaido, Honshu, Shikoku, Kyushu), Korean Peninsula.

Remarks. C. matsumurai is distinguished from other *Crematogaster* species by the short propodeal spines, which are very short and blunt to a little long and triangular.

Crematogaster nawai Ito **stat. nov.**

(Figs. 3, 4)

Crematogaster auberti var. *nawai* Ito, 1914a: 41–43. Worker. Type locality: Ôbata in the Island of Hondo [correctly, Ôbata, Kumamoto-ken, Kyushu; see Ito, 1914b], (26–XI–1911, Yasushi Nawa leg.). [3 cotype workers in MHNG examined.]

Crematogaster (*Acrocoelia*) *auberti* var. *nawai*: Ito, 1914b: 135–138. Worker.

Crematogaster (*Acrocoelia*) *auberti* var. *nawai*: Santschi, 1930: 263.

Crematogaster laboriosa Smith, 1874: 407. Worker. Type locality: Hiogo [collector unknown]. [preoccupied, nec *Crematogaster laboriosus* Smith, 1860: 109, which was synonymized with *Solenopsis geminata* subsp. *rufa* (Jerdon) by Emery (1922: 197). Homonymy indicated by Bolton (1995: 155).] [Holotype worker in BMNH examined.] **syn. nov.**

Crematogaster (*Acrocoelia*) *laboriosa*: Santschi, 1930: 264. not *Crematogaster* (*Acrocoelia*) *laboriosa*: Wheeler, 1928: 108–110. Worker, male. [misidentification judging from his description.]

Measurements (worker). HL 75–91, HW 75–91, CI 100–104, SL 64–74, SI 81–85, EL 18–22, FW 31–36, PW 45–56, WL 85–104, PSL 8–11, PSD 33–41, PtW 26–31, PPW 23–29 (*laboriosa* holotype and 3 *nawai* cotypes measured).

Material examined. ⟨Honshu⟩ 1 worker, Shirahama, Wakayama Pref., 0 m alt., 29–X–1973, K. Onoyama leg.; 1 dealate female, 2 workers, Shionomisaki, Wakayama Pref., 0 m alt., 30–X–1973, K. Onoyama leg.; 4 workers, Kii-oshima I., Wakayama Pref., 1–IV–1976, K. Onoyama leg.; 4 workers, Banshoyama, Seto, Wakayama Pref., 20 m alt., 3–XI–1973, K. Onoyama leg.; 2 workers, Haze-kaigan, Iki I., 0 m alt., 28–III–1978, K. Onoyama leg. ⟨Shikoku⟩ 1 worker, Sukumo, Kochi Pref., 12–VII–1906, M. Matsumura leg. ⟨Kyushu⟩ 1 worker, Tsutsuzaki, Tsushima I., 40 m alt., 30–III–1978, K. Onoyama leg.; 1 worker, Beppu, Oita Pref., 10–VII–1916, M. Matsumura leg. ⟨Ryukyus⟩ 1 alate female, 4 workers, Ioutorishima I., 24–VIII–1973, T. Abe leg.; 2 workers, Inbu, Okinawa I., 20–VII–1974, M. Morisita leg.

Distribution. Japan (Honshu, Shikoku, Kyushu, Ryukyus), Korean Peninsula, Taiwan?.

Remarks. C. nawai is distinguished from other Japanese *Crematogaster* species by the round lateral border of mesonotal dorsum, the smooth mesosomal dorsum, and the longer-than-wide petiole. Wheeler's (1928) identification of *C. laboriosa* is erroneous judging from his description which stated the "petiole broader than long".

Crematogaster teranishii Santschi **stat. nov.**

(Figs. 5, 6)

Crematogaster (*Acrocoelia*) *brunnea* st. *teranishii* Santschi, 1930: 265. Worker. Type locality: Hashida, Nugata-Len [correctly, Niigata-ken] (6 workers, 25-VIII-1915, S. Hochino leg.). [3 syntype workers in NMB examined.]

- *Crematogaster* (*Acrocoelia*) *brunnea* st. *ruginota* var. *azumai* Santschi, 1941: 275. [Unavailable name.] [2 'syntype' workers from Yazé, Akita-ken in NMB are here assigned to *C. teranishii*]

Measurements (worker). HL 76–94, HW 78–99, CI 99–105, SL 62–73, SI 74–80, EL 17–21, FW 31–39, PW 45–60, WL 85–106, PSL 11–15, PSD 32–38, PtW 28–38, PPW 25–32 (3 *teranishii* syntypes and 2 st. *ruginota* var. *azumai* 'syntypes' measured).

Material examined. ⟨Honshu⟩ 2 workers, Miharashiyama Park, Asamushi, Aomori Pref., 20 m alt., 26–IX–1993, K. Onoyama leg.; 2 workers, Kitayamazaki-tenboudai, Iwate Pref., 30 m alt., 5–VIII–1972, K. Onoyama leg.; 2 workers, Jyoudogahama, Iwate Pref., 0 m alt., 6–VIII–1972, K. Onoyama leg.; 2 workers, Itou, Shizuoka Pref., 40 m alt., 19–II–1975,

K. Onoyama leg.; 3 workers, Shuzenji-onsen, Shizuoka Pref., 200 m alt., 23–II–1975, K. Onoyama leg.; 1 worker, Kanazawa Univ., Kenrokuen, Kanazawa, Ishikawa Pref., 16–VIII–1990, S. Amano leg.; 1 worker, Sugou, Ashu, Kyoto Pref., 380 m alt., 1–VI–1973, K. Onoyama leg.; 2 workers, Mudouji, Mt. Hiei, Kyoto Pref., 630 m alt., 14–VI–1973, K. Onoyama leg.; 3 workers, Yoshidayama, Kyoto Pref., 80 m alt., 10–I–1975, K. Onoyama leg.; 4 workers, Kyoutanabe, Kyoto Pref., 80 m alt., 21–IX–1993, K. Onoyama leg.; 2 workers, Asa-cho, Asakita-ku, Hiroshima, Hiroshima Pref., 13–X–1991, K. Onoyama leg.; 2 workers, Hashirano, Iwakuni, Yamaguchi Pref., 26–III–1978, K. Onoyama leg. ⟨Kyushu⟩ 1 worker, Oura, Tsushima I., 170 m alt., 29–III–1978, K. Onoyama leg.

Distribution. Japan (Hokkaido, Honshu, Shikoku, Kyushu, Ryukyus), Korean Peninsula.

Remarks. C. teranishii is distinguished from other *Crematogaster* species by the striate pronotal sides.

Crematogaster vagula Wheeler **stat. nov.**

(Figs. 7, 8)

Crematogaster (*Acrocoelia*) *matsumurai* subsp. *vagula* Wheeler, 1928: 110–111. Worker, female. Type locality: Kobe, Hondo [here designated] (8 workers, [5–V–1925], F. Silvestri leg.). [3 syntype workers in MCZ examined.]

Measurements (worker). HL 75–80, HW 75–82, CI 100–103, SL 52–57, SI 68–73, EL 18–19, FW 29–34, PW 46–51, WL 79–87, PSL 8–10, PSD 35–37, PtW 30–35, PPW 25–27 (3 *vagula* syntypes measured).

Material examined. ⟨Honshu⟩ 1 worker, Motomachi, Izu-oshima I., Tokyo Pref., 40 m alt., 30–XI–1974, K. Onoyama leg.; 1 worker, Sashikichi-kaigan, Izu-oshima I., Tokyo Pref., 20 m alt., 28–XI–1974, K. Onoyama leg.; 1 dealate female, 1 worker, Jinjyayama, Shimoda, Shizuoka Pref., 50 m alt., 22–II–1975, K. Onoyama leg.; 1 worker, Shiroyama, Takahama, Fukui Pref., 10 m alt., 19–VIII–1973, K. Onoyama leg.; 2 workers, Kanmurijima, Maizuru Bay, Kyoto Pref., 10 m alt., 16–VIII–1974, K. Onoyama leg.; 2 workers, Hatakejima, Seto, Wakayama Pref., 0 m alt., 1–XI–1973, K. Onoyama leg. ⟨Kyushu⟩ 1 worker, Tsutsuzaki, Tsushima I., Nagasaki Pref., 40 m alt., 30–III–1978, K. Onoyama leg.; 2 workers, Kouzuki, Tsushima I., Nagasaki Pref., 26–VII–1972, T. Maruyama leg.; 1 worker, Nishinoomote, Tanegashima I., Kagoshima Pref., 19–VIII–1973, S. Honda leg. ⟨Ryukyus⟩ 2 workers, Ibudake, Okinawa I., 19–II–1983, H. Takamine leg.; 3 workers, River Fuku Bridge, Okinawa I., 28–VI–1974, K. Onoyama leg.; 2 workers, Sesokojima, Okinawa Pref., 24–VI–1983, H. Takamine leg.; 2 workers, Nago, Okinawa I., 27–VII–1974, K. Onoyama leg.; 2 workers, Kitanakagusuku, Okinawa I., 60 m alt., 4–IV–1987, K. Onoyama leg.; 2 workers, Sueyoshinomori, Naha, Okinawa I., 8–VII–1974, K. Onoyama leg.; 3 workers, Shuri, Naha, Okinawa I., 26–VI–1974, K. Onoyama leg.; 1 worker, Ryuutan-ike, Naha, Okinawa I., 90 m alt., 8–III–1984, K. Onoyama leg.; 3 workers, Tomigusuku, Okinawa I., 10–III–1984, Y. Fukumoto leg.; 1 worker, Sakieda, Ishigaki I., 23–VII–1977, H. Takamine leg.; 1 worker, West of Toyohara, Iriomote I., 10 m alt., 3–VII–1974, K. Onoyama leg.; 1 worker, Shirahama, Iriomote I., 200 m alt., 22–III–1975, K. Onoyama leg.

Distribution. Japan (Honshu, Shikoku, Kyushu, Ryukyus).

Remarks. C. vagula is distinguished from other Japanese *Crematogaster* species by the concavity on mesonotal dorsum, which is configured by raised carinae on dorsolateral corner of mesonotum, and the anteriorly concave propodeal dorsum, and by the mostly appressed hairs on hind tibiae.

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